Community Resilience Center of Excellence

Proposer Webinar

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National Institute of Standards and Technology

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Webinar Agenda

1:00 pm	Welcome	Jason Boehm, NIST
1:05 pm	Overview of NIST Resilience Programs	Theresa McAllister, NIST
1:20 pm	Overview of Federal Funding Opportunity (FFO)	Jason Boehm, NIST
1:50 pm	Question and Answer Session	

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Presentation Overview

- NIST Centers of Excellence Program

- Community Resilience

- Community Resilience Center of Excellence

- Federal Funding Opportunity (FFO)

NIST Centers of Excellence Program

The NIST Centers of Excellence will:

- Enable collaborations between NIST and Leading Research Institutes in areas of emerging technology important for NIST.

- Provide new opportunities for training in measurement science.

- Enhance technical innovation through early alignment of measurement science with emerging and innovative new fields of research.

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NIST Centers of Excellence Program

- Each center is targeted at $20M over five years with an option for a five year renewal

- FY2013: NIST awarded one Center focused on Advanced Materials

- FY2014: NIST expects to award the Resilience Center of Excellence and announce an additional competition for a Forensics Science Center of Excellence

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Community Resilience

- Resilience is the ability to "prepare for and adapt to changing conditions and withstand and recover rapidly from disruptions."

  - our communities too often suffer catastrophic losses when subjected to disruptive events such as hurricanes, tornados, earthquakes, or wildfires. The National Academies described disaster resilience as a "national imperative,"

  - economic damages from natural disasters in the United States exceeded $55 billion, with 14 events costing more than a billion dollars in damages each in 2011.

- Community resilience requires consideration of several key dimensions.

- Interdependencies and cascading effects of damage between buildings and infrastructure lifelines can result in greatly increased recovery times and costs.

- Achieving resilient performance at a community level takes time and planning, and requires informed decision making that prioritizes investments.

- Science-based tools are needed to address all dimensions.

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NIST Community Resilience Programs

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Resilience Concept

- Maintain acceptable levels of functionality during and after disruptive events
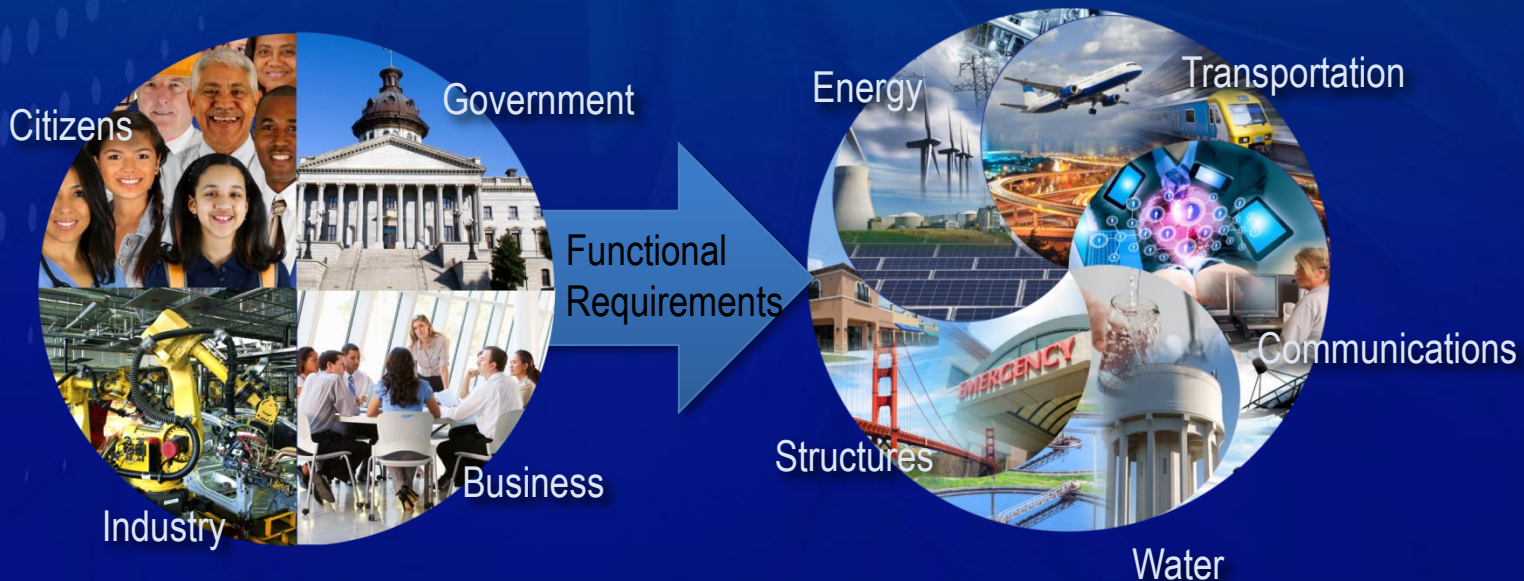- Recover full functionality within a specified period of time
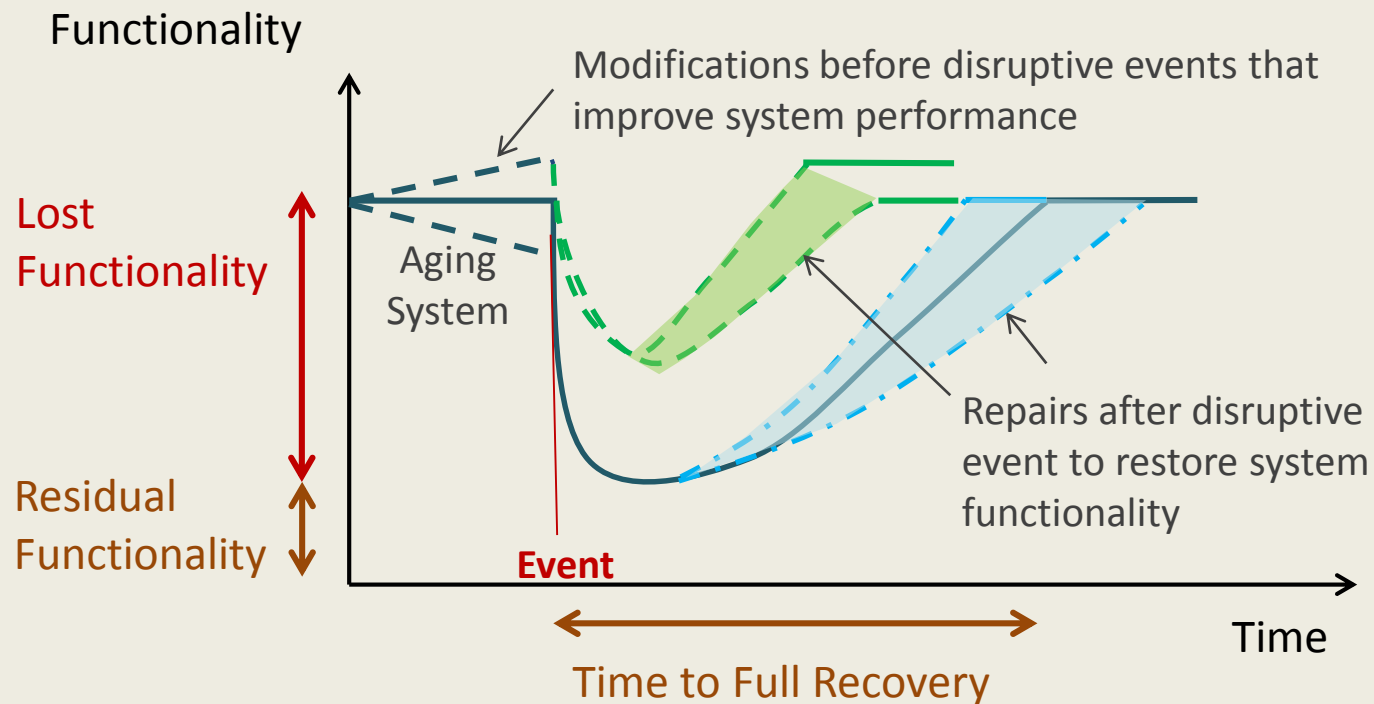
Adapted from Bruneau, 2003 and McDaniels, 2008

Community Needs Drive Functional Requirements for the Built Environment

- Resilience needs to be defined at a systems level -- community, regional, or national levels.

  - Performance of buildings and infrastructure systems needs to be based on their role in the community, social needs, and risk management

  - Resilience levels need to be defined at the community scale for multiple levels of hazards and corresponding performance of the built environment

Citizens

Government

Industry

Business

Functional Requirements

Energy

Transportation

Communications

Structures

Water

What is the Problem?

- The Built Environment Fails in Disaster Events Repeatedly

    - Natural and man-made disasters cause an estimated $57B in average annual costs.

    - Large single events can cause losses exceeding $100B.

    - Current approach of post-event response and rebuilding is impractical and inefficient for dealing with natural disasters.

- Performance of the built environment is strongly dependent on codes and standards at the time of their construction, as well as enforcement and maintenance.

- There is no scientific basis for developing quantitative methodologies or metrics to assess the resilience of communities.

- A resilience-based approach will provide the framework and guidance needed to enable communities to resist, respond to, and recover from hazard events more rapidly and at lower cost.

What is the Problem?

Risk Communication

Many communities believe that adoption and enforcement of codes and standards make them resilient. The concept of life safety and minimum criteria are not well understood.

Hazard occurrence is often expressed as an annualized risk, which seems unlikely relative to other pressing needs. Risk of damage is not understood by many communities.

Stove-piped system design

Codes and standards are developed independently, by different processes (e.g., public consensus, industry guidelines, regulations), and for different performance criteria and goals

The built environment is highly interconnected; current design practices do not address system interdependencies

Cascading events result from multiple failures that lead to unanticipated consequences

Community Resilience for the Built Environment

- Natural hazards
- Manmade hazards
- Degradation
- Climate change

- Performance Goals
- Mitigation
- Response
- Recovery

Resilience Framework

NIST is convening workshops and a panel on disaster-resilience standards to develop a comprehensive, community-based resilience framework and provide guidelines for buildings and infrastructure:

- Disaster Resilience Framework will provide a framework of community performance goals and best practices to support community resilience and identify research needs
- Disaster Resilience Standards Panel (DRSP) will be established in Spring 2015 to expand and refine the Framework and develop Model Resilience Guidelines

Workshops support the framework development through broad stakeholder engagement:

- Gaithersburg, MD, April 7, 2014
- Hoboken, NJ, July 30, 2014
- Norman, OK, October 27-28, 2014
- Western U.S., January 2015
- Southeast U.S./Gulf Coast, April 2015
- West Coast, July 2015

Resilience Framework

- The initial version of the Resilience Framework will focus on the role that buildings and infrastructure lifelines play in ensuring community resilience.

- The Framework will:

  - Establish types of performance goals and ways to express them

  - Identify existing standards, codes, and best practices that address resilience

  - Identify gaps that must be addressed to enhance resilience

  - Capture regional differences in perspective on resilience

- See http://www.nist.gov/el/building_materials/resilience/index.cfm

Community Resilience Research for the Built Environment

Systems-based models to conduct detailed studies of disruptions to the built environment and social institutions

Economic-based models for communities to develop plans and identify priorities

Resilience assessment methodologies and economic decision support tools for communities to evaluate needs, develop plans, and identify priorities

NIST has built a substantial research portfolio on improving the resilience of Buildings, Infrastructure, and Communities

- NIST has had a *strategic goal on Disaster-Resilient Structures and Communities* since 2008 (http://www.nist.gov/el/disresgoal.cfm).

- NIST *measurement science research* provides the technical basis for improvements to model codes, standards, and practices (http://www.nist.gov/hsdr-portal.cfm).

- NIST provides the *critical knowledge, metrics, and tools* to enable the transformation to emerging *performance-based standards and codes*.

- NIST performs *technical studies in the aftermath of disaster and failure events* to derive lessons learned and to recommend needed changes to codes, standards, and practices (http://www.nist.gov/el/disasterstudies/index.cfm).

- NIST staff *participate actively in standards and codes development* (e.g., ASCE, ASTM, ACI, AISC, ICC, NFPA) to implement research results to improve the safety and performance of buildings, infrastructure, building occupants, and emergency responders.

NIST Disaster and Failure Studies

Earthquakes	Hurricanes	Construction/ Building	Tornadoes	Fires
San Fernando, CA (1971)	Camille, MS/LA (1969)	Skyline Plaza Apartments, Bailey's Crossroads, VA (1973)	Jarrell, TX (1997)	DuPont Plaza Hotel, San Juan, PR (1986)
Mexico City, Mexico (1985)	Alicia, Galveston, TX (1983)	Willow Island Cooling Tower, WV (1978)	Spencer, SD (1998)	First Interstate Bank Building, Los Angeles, CA (1988)
Loma Prieta, CA (1989)	Hugo, SC (1989)	Kansas City Hyatt Regency, Kansas City, MO (1981)	Oklahoma City, OK (1999)	Loma Prieta Earthquake, CA (1989)
Northridge, CA (1994)	Andrew, FL (1992)		Joplin, MO (2011)*	Hillhaven Nursing Home (1989)
Kobe, Japan (1995)	Hurricanes Mitch and Georges, LAC (1998)	Riley Road Interchange, East Chicago, IN (1982)		Pulaski Building, Washington, DC (1990)
Kocaeli, Turkey (1999)	Hurricanes Katrina and Rita (2005)	Harbor Cay Condominium, Cocoa Beach, FL (1981)		Happyland Social Club, Bronx, NY (1990)
Maule, Chile (2010)*				Oakland Hills, CA (1991)
Christchurch, NZ (2011)*		L'Ambiance Plaza, Hartford, CT (1987)		Hokkaido, Japan (1993)
				Watts St, New York City (1994)
		Ashland Oil Tank Collapse, Floreffe, PA (1988)		Northridge Earthquake, CA (1994)
		U.S. Embassy, Moscow, USSR (1987)		Kobe, Japan (1995)
				Vandalia St, New York City (1998)
		Murrah Federal Building, Oklahoma City, OK (1995)		Cherry Road, Washington, DC (1999)
				Keokuk, IA (1999)
		World Trade Center Disaster, New York, NY (2001)		Houston, TX (2000)
				Phoenix, AZ (2001)
		Dallas Cowboys Indoor Practice Facility, May 2009		Cook County Administration Building Fire (2003)
				The Station Nightclub, RI (2003)
				Charleston, SC, Sofa Super Store Fire (2007)
				Witch Creek & Guejito, CA, WUI Fire (2007)
				Amarillo, TX, WUI Fire (2011)

* Ongoing

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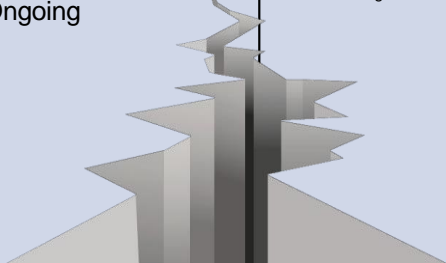
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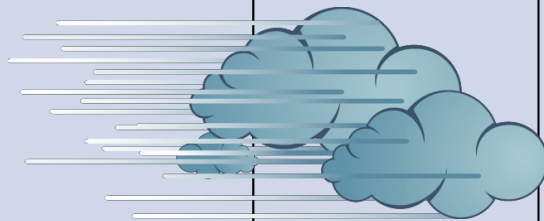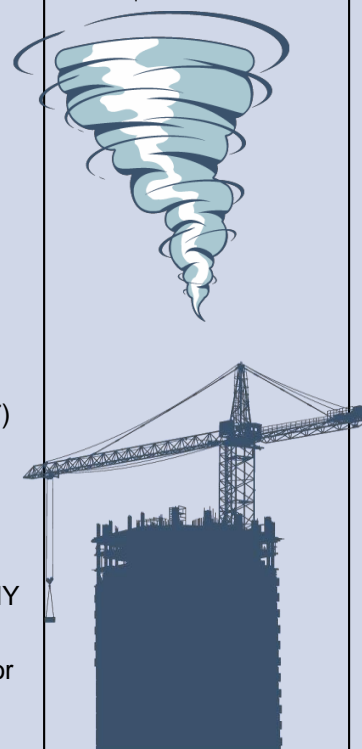
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Summary

- NIST conducts research and develops performance-based tools to understand and improve the resilience (performance, damage, and recovery) of buildings, infrastructure, and communities.

- NIST conducts disaster and failure studies to learn from these events, and recommend needed changes to codes, standards, and practices

- NIST works in close partnership with industry, standards, and codes development organizations to implement the results of our research.

Summary

- NIST is conducting parallel research efforts to accelerate the development of knowledge and tools for community resilience in two areas:

  - Disaster Resilience Framework and Guidelines to improve the performance of buildings and infrastructure systems to improve community resilience

  - Computational modeling of buildings and infrastructure systems, including system interdependencies, disaster data collection methods, and disaster data storage

- The Center of Excellence will provide complementary support to the NIST efforts in the following areas:

  - Computational Modeling Environment for Community Resilience

  - Data Management Tools for Community Resilience

  - Resilience Data Architecture Validation Studies

What is the Objective of the Community Resilience CoE?

NIST is initiating research to develop a systems-based modeling environment for evaluating the impacts of loss of function in the built environment and the consequential effects on community response and recovery.

The envisioned computational modeling environment will be a research tool that will establish a scientific basis for understanding resilience at a community level.

The long-term objective is to provide decision-makers and professionals with methods and tools to support cost-effective infrastructure designs and investments that make our communities more resilient.

Our Existing Resilience Analysis Capability is Limited

- While limited methods exist to evaluate vulnerability of independent assets (e.g., buildings or power grids) to specific hazards, there are no existing tools to evaluate the expected performance of buildings and infrastructure systems from a community-resilience perspective.

How will the CoE Achieve this Objective?

By combining NIST's expertise with disaster and failure studies with the Community Resilience Center of Excellence, the next level of science-based modeling and desired performance levels can be achieved to enhance community resilience through the following research areas:

1. Computational Modeling Environment for Community Resilience

2. Data Management Tools for Community Resilience Systems

3. Resilience Field Studies

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1. Computational Modeling

The COE will work towards an integrated, multi-scale, computational modeling environment to accelerate development of systems-level models to enable new standards and tools for enhancing Community Resilience

The COE scope includes buildings and other structures, energy systems, transportation systems, communication and information systems, and water and wastewater systems.

The modeling tools will support evaluation of the potential impact of disasters to buildings and infrastructure systems for:

- Building and infrastructure lifeline interdependencies and cascading effects of failures among infrastructure systems and buildings;

- Decision making for planning, risk mitigation, response, and recovery with specific consideration of corresponding infrastructure system performance; and

- Metrics that quantify the state and improvement of community resilience with regard to the built environment and societal needs.

Sensitivity studies will examine the effect of parameters, such as event sequence, interdependencies, time, or cost, on the outcomes and community resilience.

2. Data Management Tools

The COE will foster the development of data architectures and data management tools to enable disaster resilience planning for emergency and decision-making officials, code and standards professionals, engineering design experts, and researchers.

The data management tools must include:

- Development of standardized data ontology, format, and other informatics characteristics to enable the collection, storage, and data analysis appropriate for a spectrum of hazard types and resilience infrastructure data.

- Development of a resilience data architecture that will accommodate system-level computational models with data for model input and validation.

3. Resilience Field Studies

The Resilience CoE will conduct studies to validate resilience data architectures, data management tools, and models for a variety of hazard events including:

- Tornado, hurricane, earthquake, flood, Wildland-Urban Interface (WUI)

- Effects of climate change, and effects of aging infrastructure

These field studies will be an opportunity to exercise new data formats and collection methods.

Community Resilience CoE
FFO Overview

- Funding: $4 million per year for five years, with possibility for an additional five year award.

- Application Process: Single application. No pre-application is required.

- Cost Share: Cost sharing is not required.

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How Does One Apply?

Information for successful application submission on the Grants.gov system is detailed in the "For Applicants" section found in red on the left side of the www.grants.gov home page. The All About Grants, Applicant FAQs, and Submit Application FAQs sections found under the Applicant Resources option are particularly important

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Timing

- Application is due <u>no later than 11:59 p.m. Eastern Time, Friday, September 12, 2014 via the Grants.gov website</u>.

  - To avoid any potential processing backlogs due to last minute Grants.gov registrations, applicants are highly encouraged to begin their Grants.gov registration process early.

- Anticipated Announcement and Award Dates.

  - Review and selection is expected to be completed in October 2014.

  - Award processing and the earliest anticipated start date for the award made under this FFO is expected to be December 12, 2014.

Eligibility

- Accredited institutions of higher education and organizations located in the United States and its territories.

- You may partner with others, but an organization may only be the lead organization on one proposal.
  - In a team or consortium, eligible subawardees are U.S. organizations, accredited institutions of higher education, commercial organizations, and state, tribal, and local governments. Federal agencies may participate in projects but may not receive NIST funding.

- ***FFRDC, energy lab contractors, or other special situations should consult their GC to determine eligibility.***

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Frequently Asked Questions

www.nist.gov/coe/resilience

- Check back frequently. Updated on a regular basis with questions received. Answers are shared with everyone in order to ensure fairness.

- The FAQ site contains a subscription feature. Simply enter an email address in the dialogue box on the FAQ page.

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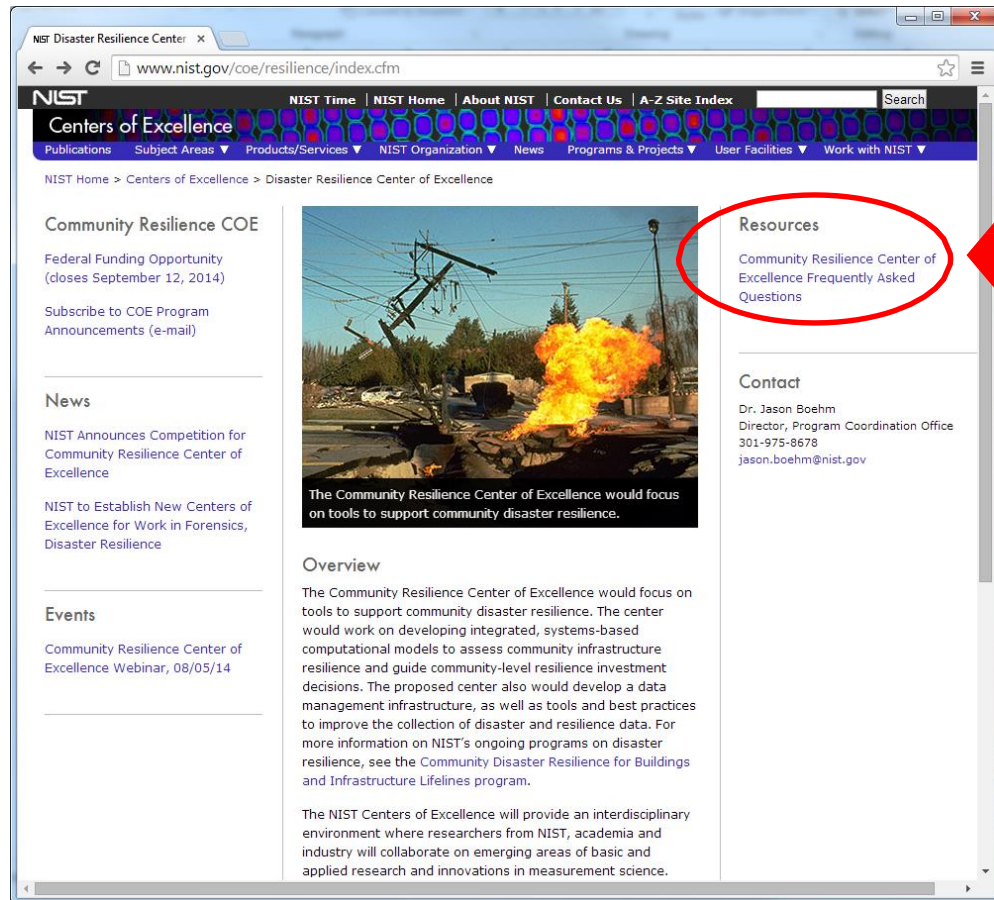
What We Expect to see in a Successful Proposal

- Clearly articulated technical approach and program plan

- Evidence of ability to manage large, multi-disciplinary program

- Demonstrated expertise and history of research in resilience

- Clear plan for engaging stakeholders

- Access to facilities and overall infrastructure needed to accomplish program objectives

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Evaluation Criteria

- Rationality (0 – 15 points)

- Experience, Qualifications, and Resource Availability (0 to 40 points)

- Technical Plan (0 to 40 points)

- Success Metrics (0 – 5 points)

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Evaluation Criteria - Rationality

- Rationality (0 – 15 pts)

  The quality of the applicant's approach to clearly and effectively address scientific and technical challenges relevant to the objectives of the Community Resilience Center of Excellence. The structure, clarity, and effectiveness of the overall approach will be considered.

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Evaluation Criteria - Experience

- Experience, Qualifications, and Resource Availability (0 to 30 pts)

  The extent to which the applicant has access to the necessary facilities and overall support to accomplish project objectives. Factors considered as a whole and not given particular weights within the category include:

  1. the degree to which community resilience aspects are addressed in the proposal;

  2. the experience and qualifications of key personnel and the breadth and depth of the multidisciplinary team;

  3. the quality of organizational resources proposed to be used on the project;

  4. the rationality and potential effectiveness of any planned subawards and/or contracts;

  5. plans for staff exchange of extended duration, for example of more than sixty (60) days, between NIST and the applicant, including the type and number of personnel.

Evaluation Criteria – Technical Plan

- Technical Plan (0 to 40 pts)

    The technical merit of the proposed work and the value it would contribute to future breakthroughs in community resilience. Factors considered as a whole and not given particular weights within the category include:

    1. creativity and originality of the proposed approach;

    2. plausibility of the technical approach;

    3. scope of work, including the number and type of modeling environments and the nature of proposed inter-disciplinary approaches;

    4. the magnitude and reach of potential technical outcomes;

    5. linkage between the technical outcomes and industry and community needs as described in the proposal; and

    6. degree of integration with the efforts and outputs of NIST programs and capabilities in the areas of computational modeling environment for community resilience, standardized data management tools for disasters, disaster studies deployment tools and standards, and field studies of multiple hazard events.

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Evaluation Criteria – Success Metrics

- Success Metrics (0 – 5 pts)

    The clarity and quality of proposed metrics and mechanisms for evaluating the effectiveness of outputs from the Community Resilience Center of Excellence, including but not limited to the potential for utilization by communities and professionals to enhance resilience.

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Review and Selection Process

- Initial Administrative Review

- Full Review of Eligible, Complete, and Responsive Applications
  - Each application will be reviewed by at least three (3) independent reviewers using the evaluation criteria
  - Scores will be determined on an individual basis
  - All applications will be provided to the Evaluation Panel

- Evaluation Panel
  - Consist of NIST staff and/or other federal agency employees
  - Provide adjectival rankings of proposals for selecting official

Review and Selection Process

- Evaluation Panel will prepare and provide a final adjectival ranking taking into consideration the following
    - results of the reviewers' evaluations;
    - the extent to which the proposed scope of the research (materials, computational methods, personnel, or equipment) is complementary to the research programs and research goals in these areas at NIST.
    - relevance of an application to the program as described in Section I of this FFO.
- Adjectival Rankings
    - Fundable, Outstanding
    - Fundable, Very Good
    - Fundable
    - Unfundable

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Review and Selection Process

- Selection Official
    - Associate Director for Laboratory Programs (or designee)
    - Select an application to recommend to the Grants Office based on one or more of the following selection factors:
        - the results of the reviewers' evaluations; the Evaluation Panel evaluation; the availability of funds;
        - the extent to which the proposed scope of the research (materials, computational methods, personnel, or equipment) is complementary to the research programs and research goals in these areas at NIST;
        - the relevance to the program as described in Section I. of this FFO; and
        - whether the project duplicates other projects funded by the Department of Commerce or other Federal agencies

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Points of Contact

Programmatic and technical questions	Simon Frechette National Institute of Standards and Technology Phone: (301) 975-3335 Fax: (301) 216-0529 E-mail: simon.frechette@nist.gov
Application submission	Christopher Hunton Administrative Support & Document Control Office NIST Phone: 301-975-5718 Fax: 301-975-8884 E-mail: christopher.hunton@nist.gov Grants.gov Phone: 800-518-4726 E-mail: support@grants.gov
Grant rules and regulations	Scott McNichol Grants Management Division NIST Phone: 301-975-5603 Fax: 301-975-5976 E-mail: scott.mcnichol@nist.gov

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Web

Resilience Center of Excellence web page:
http://www.nist.gov/coe/resilience

Questions

Thank you for your interest in the
NIST Community Resilience Center of Excellence.

We will now take questions from the webinar attendees.

Back up Slides

Collaborations with NIST Staff

- The Community Resilience Center of Excellence Program Description specifically anticipates collaboration with NIST.

- Applicants are not required to collaborate with specific NIST employees

- Applicants may propose staff exchanges and other research collaboration activities without proposing any specific NIST collaborators.

- If the applicant wishes to propose collaboration with a specific NIST employee, the statement of work should include a statement of this intention, a description of the collaboration, and prominently identify the NIST employee(s) involved, if known.

- Any collaboration with an identified NIST employee that is approved by appropriate NIST management will not make an application more or less favorable in the competitive process.